Human Error Dominant Cause of New UST Releases

By Mike Trombetta Chief, Hazardous Waste Site Cleanup Bureau Montana Department of Environmental Quality

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Environmental Quality

the 65 petroleum releases confirmed in Montana during 2005, over 70 percent are attributable to human error and not to corrosion or equipment failure. These rough statistics, gathered from unofficial tracking of releases over the last five years, appear to show a consistent trend. Human error includes activities such as overfilling vehicles during refueling or overfilling the UST during a fuel delivery. Less frequently, this category of release includes actions such as damage to tank systems caused through accidents or improper installation and repair.

We have all heard of cases where someone drives off with the dispenser hose still in their tank or a driver losing control and ramming a dispenser or above-ground tank. Although this type of vehicular damage only accounts for about one release per year in Montana, it typically presents a more noteworthy fire or explosive hazard. Other less dramatic human error causes include workers accidentally driving concrete stakes through fiberglass tanks and pipes. We even have one case of a concrete worker driving a stake through both walls of a two-inch steel pipe. The guy really wanted to get the spike into



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Surprises Beneath the Streets

by Leslie McCartney of The Montana Standard, April 29, 2006 reprinted by permission

ast week, crews hired by the Montana
Department of Transportation toiled at what they
thought was a routine job on Arizona and
Platinum near Butte High.

But just as they drilled to install a signal pole, they hit something unexpected: two large underground gas tanks — both empty.

"We usually do a pretty good investigating before we do a project," said Jeff Ebert of the Butte office of the state transportation department. However, with Butte's history, surprises crop up, he added.

"We've ran into (unknown) vaulted sidewalks in the uptown and old storm drains before," he said. "It's part of the legacy." Ebert said that apparently the sliver of land had once been home to a gas station, but it had been long forgotten. Following consultation with the Department of Environmental Quality to ensure the tanks were disposed of properly, material was brought in to bring the site back up to grade. "There was some added cost and delays," Ebert said.

As the construction season starts up in Butte, contractors hired by the city to revamp Broadway Street are also finding historical surprises, namely cobblestones.

Crews have stripped the pavement and are busy replacing both water and sewer lines, said Jennifer Kerns, spokesman for the county public works department.

The cobblestones have either been put back or the extras are being taken to the city's repository, she said. Once the work is completed — Kerns said the department is shooting for the end of May — the entire street will be repaved from curb to curb.

The city got a jump on the work to ensure it was done before tourism season starts. "Come July, we can't have Broadway blocked off," she added.

She said that while people have been inconvenienced by the construction, most have been supportive of the work, knowing that it will bring improvements to the area.

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Out-of-service Tanks to be Examined This Summer

ontana's Underground Storage Tank Program will be looking at all out-of-service tanks this summer to determine their compliance with applicable regulations.

Out-of-service tanks must be protected from corrosion and either emptied to less than one inch of product or have an approved monthly leak-detection method conducted on them. The department will require USTs that are not properly protected from corrosion to be permanently and properly closed.

If tanks with over one inch of product in them do not have approved leak detection, the department may pursue enforcement action. ■

Two Appointments Pending for Petro Board

wo positions on the Montana Petroleum Tank Release Compensation Board are subject to gubernatorial reappointment after June 30.

The positions currently are held by Thomas Bateridge of Missoula, representing the general public, and by Frank

Schumacher of Black Eagle, representing service station owners.

To apply or recommend someone for board membership, contact Patti Keebler, phone: 406-444-3862, or e-mail: https://app.mt.gov/cgi-bin/governor/recommend.cgi ■

Meet Petro Board Member Shaun Peterson

haun Peterson, 41, of Helena, fills the board's statutorily required position for a representative of the insurance industry.

He has been a commercial lines insurance agent for 20 years "and counting," he says. His career, he says, is "what every young boy dreams of becoming."

Peterson was 5 when he and his family left Fort Worth, Texas, but that was time enough to become a lifelong Dallas Cowboys fan. He is a graduate of Helena Capital High School and a "proud alumni of the college of hard knocks." He and his wife, Adrienne, are parents of a daughter, Mya, 2, and three sons, Caleb, 7, Marshall, 9, and Blake, 20.

A past president and active member of a Helena Lions Club, Peterson also is an active member and leader in his church. His hobbies include coaching his son's wrestling team, as well as hunting, camping, and ATV riding.

Peterson outlines goals he would like to see the board accomplish: "I would like to see the fund become more fiscally conservative and sound for the long-term benefit of all Montana citizens."

Enforcement Report

ction so far in 2006 by the Enforcement Division of the Montana Department of Environmental Quality brought penalties against nine businesses and two government institutions for violations of the Underground Storage Tank Act.

City Service Valcon, LLC, paid a \$5,000 penalty for delivery of fuel to an unpermitted and untagged underground storage tank.

South's Country Store of Helena paid a \$2,400 penalty for failing to obtain a compliance inspection within the statutory time, operating non-permitted underground storage tanks, and failing to notify the DEQ of a change in tank ownership.

Montana State University in Bozeman paid \$1,650 as an administrative penalty for failing to conduct monthly release detection monitoring and maintain release detection monitoring records and maintain release detection equipment on the university's underground storage tank systems. MSU also was cited for failing to report a suspected release to the DEQ within 24 hours and failing to obtain a compliance inspection within the statutory time.

Mac's Market and Video of Libby paid \$1,300 in administrative penalties for failing to conduct monthly

release-detection monitoring and to monitor and maintain records on the business's underground storage tank systems.

Milk River Co-op of Havre paid a \$1,200 penalty for failure to conduct leak-detection and maintain records.

Washington Corp. of Missoula paid a \$1,050 penalty for leak-detection violations.

The Helena Branch of the U.S. Federal Reserve Bank of Minneapolis paid a \$300 penalty for failure to properly conduct leak-detection monitoring.

Stacey Oil Co. of Whitefish was assessed a \$400 maximum penalty for failure to properly conduct leak-detection monitoring.

Reed Point Sinclair was assessed a \$400 minimum penalty for failure to conduct leak-detection and maintain records.

Kenny's Super Service of Cut Bank paid a \$200 penalty for failure to conduct monthly leak-detection and to maintain records.

Bob Smith Lincoln-Mercury of Billings paid a \$200 penalty for failure to conduct leak-detection and maintain records. ■

Is Your UST System Ethanol-Compatible?

A Regulator's Perspective Reprinted by permission from L.U.S.T.Line Issue No. 52

by Jeff Kuhn, Manager Petroleum Release Section Hazardous Waste Site Cleanup Bureau Montana Department of Environmental Quality

egislation in Montana and across the United States banning the oxygenate compound MtBE has greatly increased the use of ethanol, another oxygenate slated to be the frontrunner to take the place of MtBE. Currently, 26 states and Washoe County, Nevada, have MtBE bans in-place or enacted; six states considered bans in 2005. Oxygenates are a necessary part of gasoline formulation and create the octane ratings for various grades of fuel used in internal-combustion engines.

Meanwhile, the fuel efficiency benefits and rising popularity of hybrid and flexible-fuel vehicles are also generating a great deal of interest in the use of ethanol, considered a more environmentally friendly and nationally acceptable alternative that may help loosen U.S. reliance on Middle East oil. According to the National Ethanol Coalition (http://www.ethanol.org/production.html) there are currently 94 ethanol production facilities in the U.S. and 31 more under construction.

Most folks in Montana seem to view the move toward ethanol as a positive step in the right direction—less dependence on foreign crude, and a potential boon to Montana's agricultural community that might provide the feedstock for future ethanol plants in the state. And

Clean day

September 1997

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given the average driving distances here, (it's not unusual to drive 4 hours in one direction and still be well within the state), most Montanan's are painfully aware of rising fuel costs.

However, despite the benefits of ethanol, there are potential UST system compatibility issues that need to be considered by owners and operators. A number of state websites provide information resources and fact sheets to assist UST owners and operators converting to gasoline-ethanol blends (E-blends), particularly E10. During my review of information gleaned from internet sources (e.g., industry literature, state websites, and published research), I noticed a recurring theme summed up by the following statement from the Iowa Department of Natural Resources: "Without converting to compatible equipment your UST system could degrade, and a product release could occur. Ultimately, the equipment and components must be compatible with the percentage volume of ethanol-blend you intend to use."

Many of these websites go so far as to strongly recommend or require that equipment used to dispense E-blends be certified by the manufacturer or that the owner/operator sign a "statement of compatibility," verifying that the equipment is compatible with E-blends. State and federal rules require that all components and equipment used for storing and dispensing motor fuels be compatible with the product stored. Owners and operators of UST systems in states using E-Blends need to be aware of potential compatibility problems and plan to replace equipment reported to be prone to deterioration from E-blends.

Susceptible Components

So what materials are potentially at risk or prone to deterioration from contact with ethanol? Soft metals, including brass, aluminum, and zinc, commonly found in fuel-storage dispensing systems are not compatible with ethanol, especially at higher concentrations found in E-85 motor fuel (Wisconsin DNR). Some nonmetallic materials, such as, natural rubber, polyurethane, adhesives (used in older fiberglass piping), certain elastomers, polymers used in flex piping, bushings, gaskets, meters, filters, and materials made of cork, are prone to deterioration from ethanol blends over 10 percent by volume

(Office of the Illinois State Fire Marshal). Copper and plastic in air-eliminator floats may also not be compatible with ethanol.

For detailed information regarding specific storage and dispensing equipment for E-blends, see the New England Interstate Water Pollution Control Commission's (NEIWPCC, 2001) *Health, Environmental, and Economic Impacts of Adding Ethanol to Gasoline in the Northeast States*, July 2001, pp. 70-71 at http://www.neiwpcc.org/PDF_Docs/ethvol3.pdf. Also, a list of E-85 compatible equipment can be found at http://www.e85fuel.com/information/manufacturers.htm. This publication provides a detailed and well-researched chapter on the storage and handling of E-blended fuels, with discussion regarding compatibility with specific UST-system components.

The California State Water Resources Control Board (SWRCB) strongly recommends that UST owners and operators request a written compatibility statement from respective equipment manufacturers before storing E-blends on site. Their website (http://www.swrcb.ca.gov/cwphome/ust/leak_prevention/ethanol/ethanol.htm) provides a reference list of equipment manufacturers to contact for more information. SWRCB also lists potential compatibility problems with the following UST system components:

- Single-walled fiberglass tanks installed prior to 1/1/1984
- Single-walled fiberglass and flexible piping installed prior to 1/1/1984;
- Lining material used to line old single-walled tanks for repairs or upgrade;
- Adhesives, glues, sealants, and gaskets used around the piping and other parts of the UST system (more of a concern for older systems, but may be an issue for new installations if the contractor failed to use proper material);
- Pump heads and other auxiliary equipment, including certain metals (e.g., aluminum, brasses/ bronzes) that come in contact with the product;

 Older models of some leak-detection equipment that may not operate properly or with parts that may wear out with exposure to E-blend fuels.

The SWRCB advises that if any of these components are present at a site, the owner/operator should contact the equipment manufacturer and installer to determine whether they are compatible with E-blends.

Affinity for Water

Ethanol, also known as ethyl alcohol, has a strong affinity for water (David Korotney, EPA, undated memo). This affinity to absorb water makes it even more important that water accumulation is carefully monitored and that water is removed routinely from tank bottoms. Absorbed water in fuel reduces motor fuel BTU and octane rating and can lead to phase separation, allowing the alcohol to drop out of the gasohol and form a layer of gasoline on top and a layer of ethanol on the bottom. This phase-separated alcohol/water bottom encourages the growth of aerobic bacteria, which can be detrimental to petroleum fuels and certain fuel-handling components. Phase separation can also be a problem for vehicle-fuel and ignition-system components when fuel contaminated with water is distributed.

Degradation and Accelerated Corrosion

Steel UST systems may be adversely impacted by ethanol due to accelerated corrosion caused by scouring or loosening of deposits in tanks and distribution lines. If a corrosion cell already exists, ethanol can increase the effect of scoured exposed steel surfaces and eventually cause a perforation of the steel. As mentioned, ethanol can corrode soft metals such as zinc, brass, copper, lead, and aluminum. These dissolved metals in the fuel can, in turn, contaminate a motor vehicle's fuel system.

Conductivity and ATG Probes

Capacitance probes may not work in E-blend fuels due to the higher conductivity of ethanol. Owner/operators should verify that magnetostrictive probes are alcohol compatible and that the automatic tank gauge (ATG) system is properly calibrated for E-blends.

Tank Linings

Older tank linings seem to pose a specific concern for the storage of E-blends because of the incompatibility of ethanol with epoxy-based tank linings. "Older epoxy linings

used to line steel USTs, both inside and out, have been found to soften when exposed to E-blend (10 percent ethanol by volume)" (NEIWPCC 2001, page 64 source: Downstream Alternatives, Inc., 2000; Archer Daniels Midland Co., 2000). The American Petroleum Institute (API, 1985) also found that general purpose tank linings softened when exposed to ethanol vapors. Newer formulations of UST lining material may be compatible with ethanol.

Converting Existing Storage and Dispensing for E-Blends

The following state websites provide specific recommendations for owners and operators who are converting existing fuel storage systems for E-Blends.

IOWA

The Iowa Department of Natural Resources (DNR) has an on-line checklist (http://www.iowadnr.com/lan/ust/technicalresources/ethanol.html) for upgrading UST systems for compatibility with ethanol blends greater than 10 percent ethanol by volume. Dispensers must bear the UL mark or be certified as compatible with the product stored and dispensed.

Because there are currently no E-blend-compatible dispensers available with a UL listing mark, Iowa allows incompatible dispensers a two-year phase-in for E-blend use. However, shear valves or emergency valves on existing and new UST systems must be compatible with E-blend fuel. UST systems installed after August 1, 2005 must use available compatible equipment at the dispenser if E-85 is stored and dispensed. The final phase-in for ethanol-compatible dispensing equipment in Iowa is July 1, 2007. Incompatible dispensers may not be used after that date.

During the phase-in, dispensers not certified by the manufacturer or UL marked as compatible for E-blends must be checked daily for leaks and equipment failure. Daily inspections must be completed for non-compatible dispensers and visual observations recorded on a form provided by the DNR. Any incompatible component that leaks or does not operate as designed must be removed and replaced with E-blend-compatible components. The DNR must be notified immediately of any failed component.

WISCONSIN

The Wisconsin Department of Commerce has prepared an excellent brochure that summarizes steps that should be taken to prepare UST systems for conversion to E-blends: http://commerce.wi.gov/ERpdf/bst/ProgramLetters_PL/ER-BST-PL-PreparingForEthanolBrochure.pdf. The website notes that "the first-time transition to blends of up to 10 percent ethanol should not be assumed to be trouble free" and lists a series of assessments and procedures for owners and operators to follow.

One of the most notable statements on the site is that "no level of water is acceptable for ethanol-blended fuel due to the phase-separation problems." They tell owners and operators to make certain that "all fittings and connections at the top of the tank are tight (no vapors escape and no water enters) and that all sump and spill-containment covers prevent water from entering. Any water intrusion problems must be corrected."

The brochure cautions tank owners to "clean any tank used to store ethanol to remove all sludge from the bottom of the tank. Any sludge or particulate in the bottom of the tank will be suspended in the ethanol and cause problems with filters and fuel lines."

ILLINOIS

The Office of the Illinois State Fire Marshal requires that owners and operators sign a *Statement of Compatibility* form, which can be found on their website, certifying that UST systems under their control that store E-85 are compatible with E-blends. Owners and operators must also submit a *Notification Form for Underground Storage Tanks* to the Office of the State Fire Marshal indicating the change of product that will be stored in the UST. The form must be signed by the UST-system owner. (The form may be downloaded from the OSFM web site at www.state.il.us/osfm and then following prompts to "Division of Petroleum and Chemical Safety" and then to "Download Applications" and then choose "UST Notification Form.")

The Future

Most people in the petroleum industry are keenly aware of the ongoing changes in fuel formulation due in part to advances in technology in petroleum refining, chemical engineering, automobile manufacturing, and energy conservation. Some of these changes are also due to recognition of oxygenate impacts at LUST sites and the

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"boutique fuels" with geographic-specific fuel formulations to address the needs and requirements of different areas of the country.

As with all advances in technology, the benefits of the technology should outweigh its risks. The increased use of ethanol means the decreased use of MtBE and other similar compounds that, due to their unique chemistry, have the ability to travel farther and faster in groundwater and pose a greater threat to drinking water supplies.

However, even the best technological advances have a retooling cost – both at the refinery level and at marketing and retailing levels. Ethanol typically requires bulk transportation and on-site splash blending at fueling terminals due to its affinity to absorb water in pipelines. Special handling practices and precautions must be taken.

Such considerations were a very significant part of discussion that led up to the phase-out of MtBE in California and the phase-in of ethanol in gasoline. (See *Health & Environmental Assessment of the Use of Ethanol as a Fuel Oxygenate*, California Air Resources Board, the State Water Resources Control Board, and the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment, 1999 – http://www-erd.llnl.gov/ethanol/etohdoc/index.html.)

Another important question is whether State UST inspectors, during the transition to E-Blends, will even look for potential compatibility problems by carefully inspecting specific components that are prone to degradation from ethanol. Perhaps this will require additional training or a specific module in state training programs (classroom and web-driven) that focuses on key compatibility concerns identified by the petroleum-equipment industry and other information sources.

The advent of E-blend fuels in Montana and other states has been a long-time coming. The Montana Department of Environmental Quality views ethanol as a favorable alternative to MtBE and a step in the right direction toward environmental stewardship and energy sustainability. At this time, a limited number of Montana distributors provide E-85 or other E-blends for consumers.

However, as more UST owners and operators in Montana, and throughout the nation, consider storing and distributing

E-blends, they need to plan accordingly and verify that their fuel storage systems are compatible with ethanol. Otherwise we will only succeed in creating another means for petroleum from fuel-storage systems to be released to the environment, thus carrying on our long legacy of groundwater contamination that many of us have spent our careers trying to rectify.

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- New England Interstate Pollution Control Commission (NEIWPCC) Health and Environmental Impacts of Adding Ethanol to Gasoline in the Northeast States, July 2001, pp. 70-71. http://www.neiwpcc.org/ PDF_Docs/ethvol3.pdf
- Office of the Illinois State Fire Marshal www.state.il.us/osfm
- Iowa Department of Natural Resources http:// www.iowadnr.com/lan/ust/technicalresources/ ethanol.html
- California EPA SWRCB's advisory to UST Owners and Operators Regarding Ethanol-Blended Fuel Compatibility: http://www.swrcb.ca.gov/cwphome/ust/ leak_prevention/ethanol/ethanol.htm
- California Environmental Protection Agency State
 Water Resources Control Board
 http://www.swrcb.ca.gov/cwphome/ust/leak_prevention/ethanol/ethanol.htm
- Wisconsin Department of Commerce: "Preparing For Ethanol Brochure" http://commerce.wi.gov/ERpdf/ bst/ProgramLetters_PL/ER-BST-PL preparingForEthanolBrochure.pdf

Health & Environmental Assessment of the Use of Ethanol as a Fuel Oxygenate, California Air Resources Board, the State Water Resources Control Board

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(SWRCB), and the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (CalEPA/OEHHA, 1999. http://www-erd.llnl.gov/ethanol/etohdoc/index.html

Water Phase Separation in Oxygenated Gasoline by David Korotney, EPA, Chemical Engineer, Fuels Studies and Standards Branch.

http://www.epa.gov/otaq/regs/fuels/rfg/waterphs.pdf

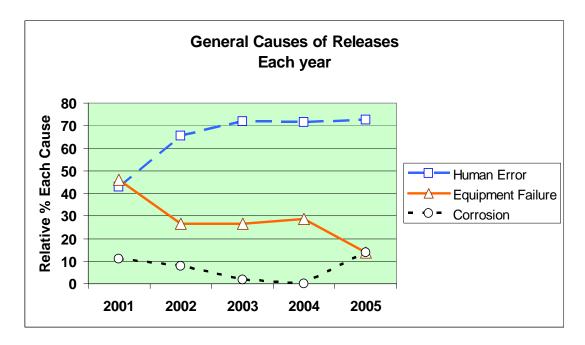
Recommended Practices and Codes:

American Petroleum Institute. (April 1985) Storing and Handling Ethanol and Gasoline-Ethanol Blends at Distribution Terminals and Service Stations. API Recommended Practice 1626.

- National Fire Protection Association (NFPA) 30, Flammable and Combustible Liquids Code, 2000 Edition; NFPA 30A Code for Motor Fuel Dispensing Facilities and Repair Garages
- Renewable Fuels Association, Fuel Ethanol: Industry Guidelines, Specifications and Procedures, RFA Publication # 960501, Revised December 2003 http://www.ethanolrfa.org/final960501.pdf
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Human Error Dominant Cause of New UST Releases - continued from page 1



Releases at pumps and dispensers

A regrettable and preventable cause of release includes small amounts of fuel spilled during pump and dispenser installation and repair work. These types of releases could be prevented by secondary containment, such as spill buckets under dispensers and liquid-tight sumps around submersible pump heads. Adding these simple components to UST systems not only prevents human-caused releases, but also contains releases from equipment failure and other causes. Many releases are caused by an accumulation of very small amounts spilled during maintenance operations over time. When the previously mentioned secondary containment sumps are not installed, workers must take extra care to catch and contain small amounts of fuel that inevitably escape during routine maintenance work. In many geologic settings across Montana, very small amounts of fuel can quickly impact groundwater. When we spend so much money and effort cleaning up spilled fuel nowadays, it's hard to understand how some professional equipment repairmen still maintain "old-school" sloppy practices. Tank owners and operators can help prevent this type of release with reminders to their repairmen of best practices and oversight of routine maintenance activities.

Improving trends

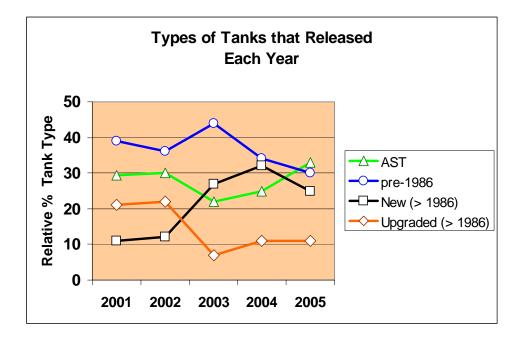
The five-year running statistics indicate that equipment failure has steadily decreased from causing nearly half of the releases in 2001 to causing only 14 percent of the releases in 2005. This marked decrease can be attributed to increased sophistication and quality of new tank

components as well as the skill and care taken by tank installers. Tank owners are also making wiser choices in their selection of equipment and choosing double-walled systems with spill buckets. Although some small operators still install single-wall equipment, large Montana distributors and national retail chains in the state are working leakprevention through double-walled systems into successful business plans. Another cause for the marked reduction in equipment failure may be attributed to Montana's three-year inspection requirement, an area in which Montana leads many other states. Release statistics seem to reflect its success. At least once every three years every facility in the state is inspected to verity compliance with regulations and identify potential equipment shortcomings. These statistics say a great deal about the skill and professionalism of licensed third-party inspectors in Montana.

Tanks that leak are tracked in four categories by the Montana Petroleum Release Section. Above-ground storage tanks (ASTs) contribute about one-fourth to one-third of the releases each year and became the major source for releases reported in 2005. Tanks categorized as "found," or pre-1986, have decreased in number since the PRS began tracking statistics in 2005. In 2005, for the first time, found tanks are second to ASTs as sources of releases. This relationship probably results from finding previously unknown tanks through increased construction activities, land transactions, and environmental investigations.

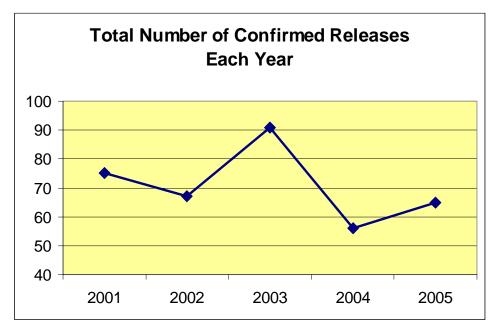
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Human Error Dominant Cause of New UST Releases - continued from page 9



A marked increase in releases originating from new, or post-1986 USTs at first appears contrary to what is expected, that is, few releases from new tanks. Combining new tanks and upgraded tanks, that is, USTs installed prior to 1986 that have been upgraded to meet current standards, produces a combined category of USTs that are "in compliance." This category has remained fairly constant as a source of releases. A closer look reveals that four-fifths of

the releases originating from new USTs in 2005 are caused by human error: spills, overfills, and vehicular damage. The other one-fifth of these releases are attributable to equipment failure that could have been prevented by double-walled systems with spill buckets. Corrosion did not account for releases from any new USTs in 2005, although we have seen a few steel USTs meeting the 1986 corrosion-protection standards rust through in previous years.



The number of total releases slowly decreased each year to around 65 in 2005. The goal for Montana to reduce the number of releases to zero and we are making headway. With continued strong partnerships among tank owners,

operators, installers, repairmen, inspectors, and the Department of Environmental Quality, the trend should continue.



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- Simplify complex regulations
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